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THE FIELD WORK OF A PHYSIOGRAPHY CLASS ON A GLACIAL PROBLEM

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NO outdoor physiographic work is more interesting to the average pupil than a study of forms of glacial deposition. For developing ability in observation and power in reasoning such work is of great value. A description of the methods of work successful with a class of high school pupils, and the results obtained, may be of interest.

The class was one of pupils of the Punchard School, Andover, Mass. There is in Andover, near the Ballardvale Station of the Boston & Maine Railroad, a typical esker and an associated glacial delta. No complete description of the forms is attempted here; simply an outline of the work is given, and a student's report, condensed, follows. Plans are also included as they show somewhat the possibilities of study afforded in the place. These possibilities are, however, not unusual, but rather, typical: possibilities as great may be found in almost any glacial region. The student's report is, obviously, incomplete and faulty, but is typical of what a pupil of high school age can do.

The class made, first, one excursion for general observation over the whole field. On this first trip note-taking was not encouraged, but thought and constructive imagination were appealed to in every possible way. The outline of work was then given. This outline was dictated to the class in order that each point might be explained as fully as necessary; experience has taught that nothing is so discouraging to a pupil as the feeling that he does not know what is expected of him. Putting the points of the outline in the form of questions gives a definiteness which is helpful to the pupil. This outline guided the work of the class in later excursions and served as a guide in making out the reports. Each pupil was

furnished also with a map of the locality; these maps were photographic enlargements of a portion of the regular U. S. Geol. Survey sheet.

OUTLINE TO GUIDE STUDY OF THE ESKER AND GLACIAL DELTA AT ANDOVER, MASS.

I.

1. What is the location of the district studied?

II.

1. Describe briefly the form named *esker*.
2. What is the length of the part of the esker which is joined to the glacial delta?
3. What is the average height?
4. What is the angle of the sides?
5. Draw a profile cross-section, to scale, of the esker.
6. Draw a plan, to scale, giving compass directions.
7. Draw a profile longitudinal section, to scale.
8. Of what material is the esker made?
9. Collect samples as far as possible, typical of the material of the esker.
10. How does the ridge connected with the delta end on the northwest?
11. Describe the continuation of the esker found farther northwest.
12. Explain the break in the esker, that is, the separation of the short part of the ridge, connected with the delta, from the main part of the esker, farther northwest.
13. Are there any evidences of stratification in the esker?
14. How do you think this esker was formed? What do you think is its relation to the sand-plain connected with it on the southeast?
15. Outline the esker on your map.

III. *The Glacial Delta.*

1. Outline on your map the delta.
2. What is its extent and form?
3. What is the "ice-contact" slope? Average angle of this slope?
4. What part of the formation is really a plain?
5. Describe the margins of the delta other than the ice-contact slope.
6. Draw profile sections. Indicate on the map the lines of these sections.

7. Of what material is the delta composed?
8. Are there evidences of stratification? Describe.
9. Where in the delta is the finest material?
10. Where is the coarsest?
11. Collect samples, as far as possible, of the typical materials found in the formation.
12. Describe, with drawings, the kettle-hole found near the "ice-contact" slope. Cause?

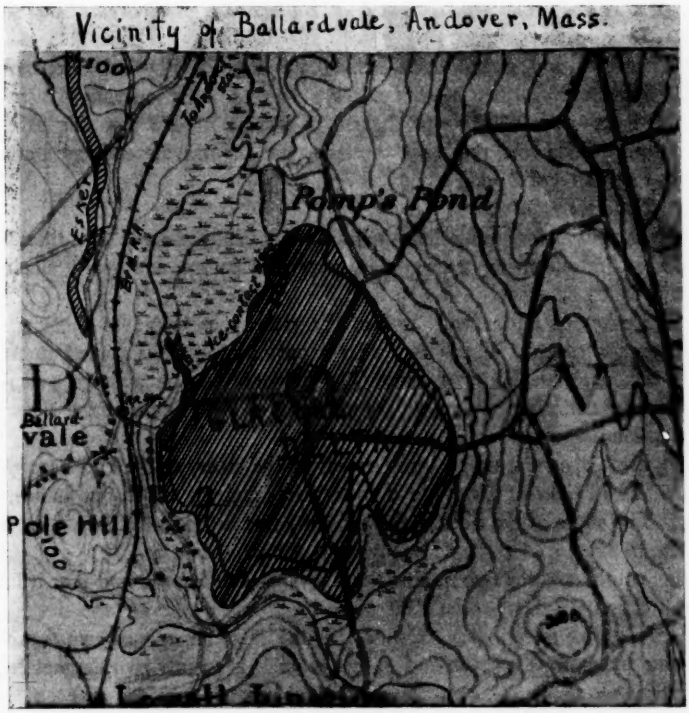


Fig. 1. Scale 2 x $\frac{1}{62500}$. Contour interval 20 ft. Enlarged about twice, from Lawrence, Mass., U. S. Geol. Survey Sheet.

IV. *Erosion.*

1. What work has recent erosion done on the delta? Make sketches.
2. What causes have made erosion rapid?

What is the rate of erosion on the ice-contact slope?

3. Describe the alluvial fans made.

V. *Drainage.*

1. Show on your map existing streams, ponds and swamps.
2. Describe the course of the Shawsheen River with respect to the formations described.
3. What may be the correlation of glacial deposits and drainage, past and present?

(PUPIL'S REPORT)

The Esker and Glacial Delta at Ballardvale, Andover, Mass.

I. *Locality.*

The esker and glacial delta, which our class in Physical Geography studied during April and May, 1905, are situated at Ballardvale, a district south of the town of Andover, Mass. They are on the east side of the Shawsheen River and not very far from the Ballardvale railway station of the "Boston and Maine".

II. *The esker.*

A narrow ridge, sometimes miles in length, composed of different grades of gravel, having an irregular, serpentine course, and gently sloping sides is called an esker.

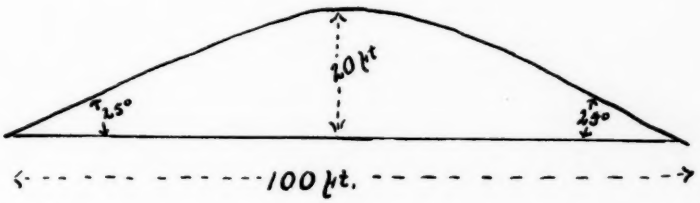
The esker of Ballardvale, east of the railway, is joined to the glacial delta on the south. The length of the part of the ridge joined to this delta is about nine hundred feet. The height is, on an average, twenty feet for the entire length and at the northern end the angle of the sides is twenty-five degrees.

Figure 2 shows a profile cross-section of the esker, at the end near the river. The height of the ridge is twenty feet and the width one hundred feet. The angle of the sides is about twenty-five degrees. Figure 3 shows a plan, to scale, of the esker. Starting at the northwest end of it and continuing southward for two hundred and seventy-five feet we find that it has the direction of thirty-seven degrees east of south. Going one hundred and seventy-five feet further, we find that the ridge has turned two degrees more to the east. For seventy-five feet more it is twenty-two degrees east of south. It continues in this same direction for one hundred and ten feet more. It now gives a sharp turn in the opposite direction, being south twenty-eight degrees west for fifty feet. It now goes due south for one hundred feet and merges into the glacial delta. The width, nearly all the way is about one hundred feet. Figure 4 is a profile longitudinal section, to scale, of the esker. At the northwest end it is twenty feet high. Continuing two hundred and seventy-five feet further we find that it has be-

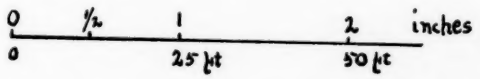
come twenty-six feet high. Going on for one hundred and seventy-five feet we find that the height becomes twenty feet. At a distance of seventy feet farther the height is twenty-four feet. It decreases greatly for the next one hundred feet, the height becoming only fourteen feet. It rises a little in the next sixty to the height of eighteen feet. It now rises to the height of twenty-two feet in the last one hundred feet.

Fig. 2.

Profile cross-section of esker, northern end of the part east of the river.



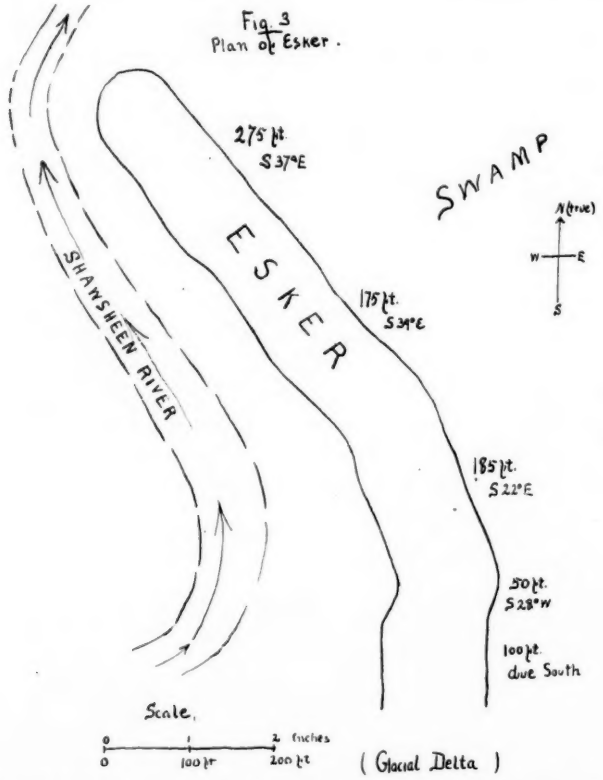
Scale, 1 in. = 25 ft.



The esker is composed of gravel and stones, some small, others nearly as large as one's head; all are rounded and with no sharp corners, showing that they were once under water. We also found that, in a place west of the river, where some material was being dug out, there were signs of stratification. This shows that the material must have been laid down under water. Samples of the material have been collected and are in the laboratory.

On the northwest the esker slopes off, at an angle of twenty-five degrees, to the floodplain of the Shawsheen River.

There is a continuation of the esker farther to the northwest. It extends in a serpentine course, more or less broken, in a northwesterly direction. It is wider and higher than the part near the glacial delta and the material is a great deal coarser.



It is not quite certain how the break, which is seen between the two parts of the esker, was formed. There may be one of three reasons: First, it may have been there in the earlier times when the esker was first formed. Second, men may have dug it away. A third and most likely the correct reason is that the river, which turns at nearly a right angle at this place, may have cut through the esker.

It seems reasonable to suppose that this esker was formed by a subglacial stream which rushed forth from its tunnel under the glacier carrying a great quantity of material. The coarser material it was forced to drop first, in the stream-bed, building the esker; but some of the finer was carried farther, probably into a glacial lake, forming the broad, level-topped glacial delta.

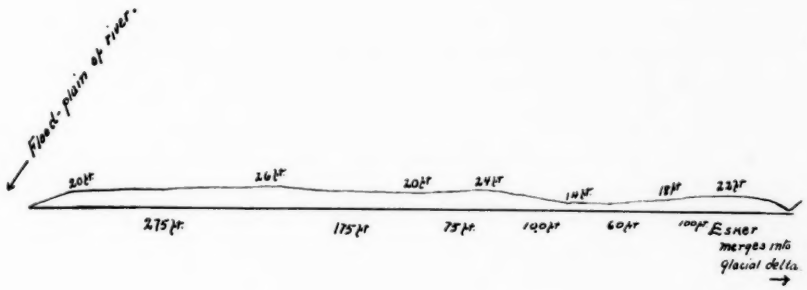


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Fig. 4
Profile longitudinal section of esker East of the Shawsheen River.

III. *The glacial delta.*

The glacial delta is a fan shaped, level-topped sand plain, with the handle of the fan represented by the esker.

The ice-contact slope is a steep slope on the northwest of the sand plain, sloping off towards the swamp bordering the river. The average angle of this slope is twenty-eight degrees.

The top, central part is a plain sloping off in all directions. The slopes of the margins are much less steep than the ice-contact slope.

The map (Figure 1) shows the general shape and extent of the sand-delta. The height of the top above the swamp north of it is about ninety feet.

The delta is composed of different kinds and grades of material from the finest sand to the coarsest gravel. Samples of the material are in the

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laboratory. The coarsest material is on the northern side, near the ice-contact slope. The reason for the finest being where it is, far out towards the margins, is that the stream coming out from under the ice dropped the coarsest material first, but as the finer material was lighter it was carried further out into the lake which was probably there at the time. There are evidences of stratification in the glacial delta, showing that the material was laid down by water. The stones in the delta are all rounded, water worn.

In the plain there are several deep holes, with sides sloping in from all directions, called kettle-holes. The side towards the north is the lowest. The kettle-hole which we noticed, the principal one near the ice-contact slope, is about thirty feet deep, two hundred feet long and the angle of the sides is about thirty degrees. It was probably formed by a large block of ice which broke off from the glacier as it was retreating back. Gravel covered this big block of ice and when the ice melted the gravel settled, forming a deep hole.

IV. *Erosion.*

There has been much erosion in the glacial delta, especially near the ice-contact slope. Deep gorges have been cut and during a heavy rainfall water rushes down these gorges, carrying material along with it, which it gets from the sides and bottoms of the gorges. The streams have to drop the material at the foot of the slope, forming fan-shaped, sandy alluvial fans. Many trees have been cut recently making erosion much more rapid than it would otherwise have been. In one place where a large tree has been cut down the roots remain and have hindered the erosion in that place. The rate of erosion backward into the plain, is about twenty to twenty-five feet a year. As the soil is rather loose and sandy it is easy to cut into it.

At the base of the ice-contact slope are the alluvial fans or fan cones. Each one is being built by a stream which in time of a heavy rain, rushes down the steep slope. At the base the velocity of the stream is checked and the sediment is there dropped, forming the fan cones. There are many distributaries crossing the fans, which lead to a small pond.

V. *Drainage.*

The main stream, in the district which we studied, is the Shawsheen River. There are several ponds, streams and many marshes as are shown on the map. The river has two sharp turns in it, one at each end of the esker along which it flows. Streams surround the glacial delta but none cut across it.

It is noticed that in the report several questions are incompletely answered or wholly unanswered. No complete answer can be given to some of the questions. The knowledge cannot come too soon that questions unanswerable, with present information, are just as warrantable as others. If all that is asked is answered the pupil is apt to think that all could be answered that could be asked.

The above report is a condensed form of one made by a member of the class who is a second year pupil in the school. All pupils of the class contributed some points to the general understanding, as there were many class discussions of the problems presented in the area.

OCEAN AND LAND TRANSPORTATION.

THE most pronounced and far reaching difference between ocean transportation and land transportation arises from the fact that the ocean is a highway without the efforts of man, and the navigator has but to provide his vehicle. By land roads must be made even for a pack train, and with the railroad, the modern type of land transportation, the building of the roadway is much the greater part of the necessary equipment. For carrying upon the ocean the completion of the ship is all that is necessary, and if she sails the winds of Providence will drive her into all seas and around the world. This fundamental difference in the ocean trade produces many peculiarities unknown upon the land. Because of the smaller capital that is required upon the ocean, we find more individuals and groups of individuals acting independently than we do in the railway traffic of the land. The single vessel operated as a unit has as much independence as the great line of steamers, and in some respects more independence. Both are alike free to pass over the high seas, to take advantage of the government surveys thereupon and to enter the harbors that connect with the land.—From *The Organization of Ocean Commerce, by J. Russell Smith.*

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MAP DRAWING

BY LYMAN R. ALLEN

State Normal School, North Adams, Mass.

"DO you promise to tell the truth, the whole truth, and nothing but the truth?" No map may unblushingly reply, "I do." None in common use can meet even the first requirement. Do you doubt it? Then glance at the maps of one continent, here reproduced from different standard text-books. (Fig. 1) "Which is right?" "That depends upon the point of view" the maps will reply. Or reflect a moment: the earth's surface is nearly spherical; our maps are commonly plane; can one paste a map of the eastern hemisphere on the globe smoothly, leaving no gaps, fitting exactly? or remove and spread flat the paper surface of a globe? All our maps represent distorted views; they view the globe in different positions and from different distances.

With increased distance (or decreased map scale) inaccuracies increase. The width of a line becomes an inch—a foot—a mile; a circle, compass-drawn, includes in the width of its pencil-line the total flattening at the poles and our highest mountain tops and lowest ocean depths. On a continental map a single swing of the coast line includes hundreds of capes and bays, which could never be separately drawn or distinguished on such a map.

It is hardly necessary to add, then, that our pupils cannot draw accurate maps. Ought it ever to be a serious question whether it is worth while to attempt exact reproductions of maps—themselves never perfectly accurate? Exact reproduction may be much more profitably undertaken in mechanical and machine drawing, with more enjoyment to teacher and pupil. Certain knowledge of conventional map forms, as of certain leaf forms, is necessary; but it should be of general form, proportion and size,—not of minute details; just as we know, to recognize or draw from memory, the form of the oak leaf, but not the peculiarities of an individual leaf.

Every map is a shorthand record; or it speaks a language foreign to us for our translation. Many of us read in it principally the printed words; we tell the relative position of the words, their order (showing the order of station names we may read from our train). We forget they are truly symbols which attempt to speak to us and to make us think; symbols which "represent" or "stand for" real things; symbols which, when we are expert, help us to abbreviate thinking. The symbol of a mountain, for example, brings up to us, when we attend strictly to it, all that we know of mountains from seeing, from climbing, from pictures, from descriptions;

it lives with us, as pages of mere words could not make it; if, however, we are studying rainfall, we think merely "a mountain here which has certain effects," and on these we focus our thought. What an advantage over the verbal description! There we must skim it all; here we single out those ideas we need for the time and push back all others to the margin of consciousness.

These foreign tongues our pupils must acquire. This is a crucial point in Geography—that upon which depends the power to roam over the whole earth and enter into living relations with all its people.

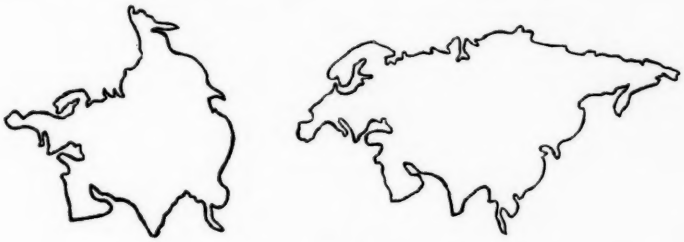

Fig. 1

Real things, if such are to be recalled by symbols, must be our starting point. There is no particular reason why caterpillars crawling over spaces enclosed by wiggly lines should signify mountain systems unless one has seen shore lines (contact lines of land and water) and slope lines (on hills or sandpiles); or why a writhing blue line should mean a river unless one has drawn the neighboring river to large, then smaller and smaller scales. Then sketch, say, some familiar hill; draw it to scales successively decreasing; recall and re-travel in the schoolroom this familiar form from its new symbol; imagine an unknown similar hill by the aid of the same symbols—here, in a nutshell, is the principle underlying all map study. If these lines (Fig. 2) mean to your pupil a hill, double-peaked; if he can trace its divides and peaks, climb up by easiest and by quickest routes, there will be little difficulty in teaching him the use of our geological survey maps, available for our own localities, in most cases, and at merely nominal cost.

In map drawing, as in much else in Geography, the railroads offer valuable help and significant hints. Can you find a transcontinental road which is not (on its own folders) the straightest, largest, altogether the most important one? "If you must change cars we will show connecting roads in light lines; if you are curious as to rivers, mountains, or state lines, we will hint at those. But our line is the important thing for you to know!" This is what the folders seem to say.

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Such railroad maps bring one feature to the focus of attention; it is seen as never when a hundred other details are given. Look at a map showing the rivers alone of the United States (Fig 3). What a revelation in the number of subjects—historical and geographical—which disclose themselves or appear in a new light; mountains, slopes, rainfall, water power, vegetation, irrigation; or pathways, exploration, rapid colonization, industrial development, national unity instead of "North and South" sectionalism. How much better is this, or a simple relief map, than a modern political map for teaching the Louisiana Purchase or the Lewis and Clarke

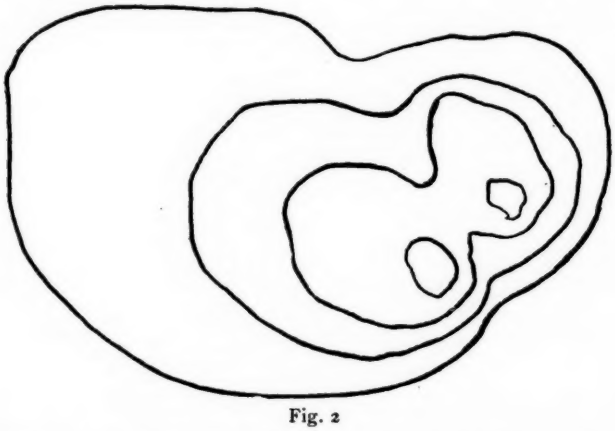

Fig. 2

Expedition! Geological maps follow the same principle and emphasize by color one set of facts. We may imitate in our schools by maps of single river systems, with fullness of details; by large outlines of single countries or states; by isolated coastlines—as of Greece, Maine, New Jersey, South Africa; by climate maps showing rainfall, isotherms, or winds; by production maps, showing one (or sometimes two or three) mineral, plant or animal products by coloring the producing regions. You have not such maps? Then let the pupils make them; trace—enlarge by pantograph—have the most accurate reproductions possible. The maps are drawn for class study; it is a part of real life, not "just school." This may constitute a second phase of map drawing.

Map drawing is also a means of testing the knowledge of the pupils. It has been said that the general shape of certain land masses should be known; those to be included are scarcely more than the continents, the United States, the state, and the town; these should be so known as to be instantly,

Fig. 3. Drainage Map of the United States

unerringly recognized—quickly, boldly, and accurately drawn. Then again, outlines of these are extremely valuable as frames within which to put details of mountains, rivers, cities, productions, railroads, climate, etc. Here the test is in the details, not the outline of the continent; for such testing printed outlines are best, such as may be obtained from D. C. Heath and other publishers. If such are too expensive teach the children

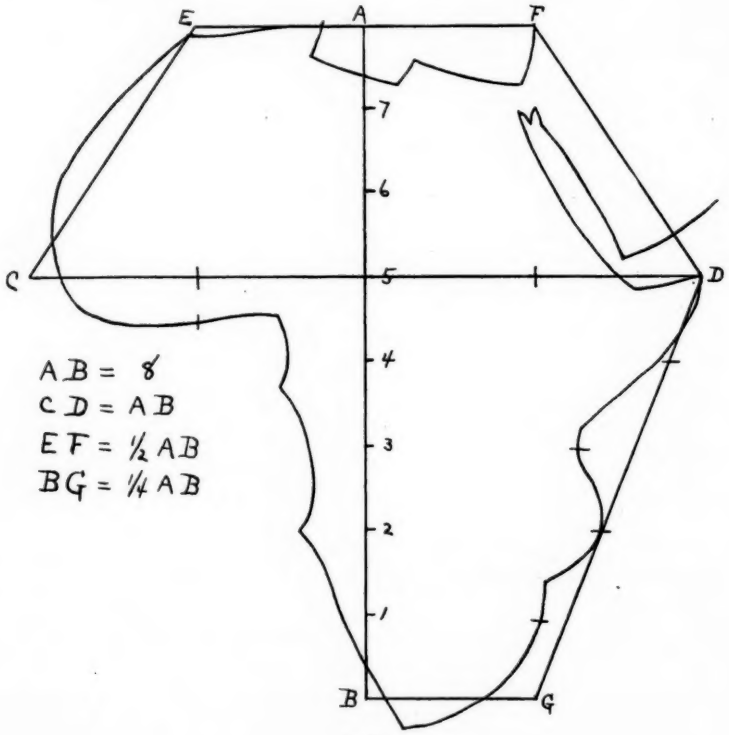

Fig. 4

to draw their own. The simpler, more generalized they are, the better; this because they may be more quickly drawn (without waste of time) and accurately—hence are a fair basis for the succeeding test. Bold, general strokes, which tell the story, serve best; wiggly, painstaking lines, drawn with laborious care, are totally unsuitable. As in sketching from objects, proportions must be correct; these should be discovered from the generalized outline (Fig. 4); then memorized and applied. Construction lines

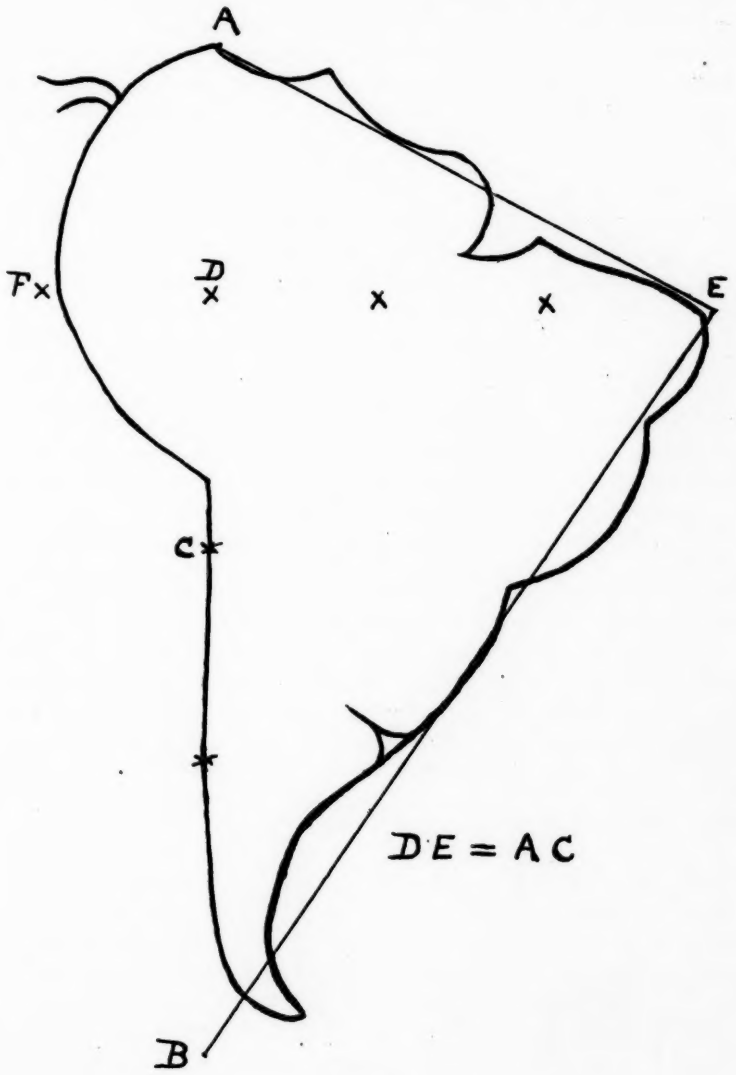

Fig. 5

may be drawn in the early stages of practice—dots merely at a later. Accuracy—of memory and of drawing—and boldness are to be insisted upon at first; speed later. The former will be attained by much practice, on paper and blackboard, under careful criticism; arm movements must be secured. Speed may then be attained by strictly limiting the time—watch in hand. Emphasize the scale of the map (the length of unit line) for the sake of knowing relative size—not for any aid in drawing.

In drawing the more irregular continents it may be better to rely upon the sense of proportion and of relative position instead of attempting to discover and memorize simple mathematical proportions; quite likely pupils of artistic feeling rather than mathematical instincts may find this better for all maps. In this case the equator, tropics, or other standard circles which cross the continent should be added; they help in the drawing as well as in fixing in mind the relative position on the earth's surface. Figure 5 will illustrate this way of working. It may be read to discover the successive steps in simplifying the outline, even to whatever straight lines seem simplest to the individual; or, conversely, the steps in memorizing or constructing the outline from straight lines, of relative length and position definitely visualized, to more and more detailed sketching of the outline.

The accompanying illustrations may at first glance seem startlingly crude. Are they unmistakable? simple and accurate in proportions? quickly drawn? suitable frames within which pupils, even if of unequal drawing ability, may recite upon measurable equality?

Map study and map drawing are vital in geography. Study then, those maps which are most accurate and appropriate for your particular object. Draw maps to learn the symbols—to prepare special maps otherwise unavailable—to test accuracy of study and power of expression. Throughout, clothe them with reality by the use of pictures, descriptions, literature, and by all that reasoning can tell lest the use of mere symbols shall shrink and formalize knowledge.

GEOGRAPHIC DEVELOPMENT OF SEAPORTS IN THE UNITED STATES

BY BESSIE A. BROWN
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WHAT are we to understand by the term "geographic"? This, first of all, it seems to me, must be pretty definitely ascertained. "Physiographic, as distinct from 'geographic,' includes the physical environment, as climate, soil, topography and the distribution of resources. 'Geographic' includes, not only the physical environment, but the human element as well."[1] It is in its broad meaning, which includes an account of man and nature, and the interactions which are an outcome of their relationship to each other that the term is here used. "The interaction of man and nature," again says Professor Trotter, "finds its expression in the productive transportation and consumption of goods."[2]

Granting then, that the relation between the physiographic and the human elements in commerce is only a phase of utilizing the resources of the earth, we shall proceed to consider what in the physical make-up of the United States has favored her commercial growth and made her the nation she now is—"the third commercial country in the world having more than 10 per cent. of the world's trade."[3] The conditions offered for industrial growth are perhaps of first importance. "The almost inexhaustible resources of iron and coal and the development of cotton raising in the South have made her one of the greatest manufacturing countries of the world,"[4] and "the development of the agricultural possibilities has created such a wealth of breadstuffs and provisions available for commerce that she has become the principal country furnishing food to Europe."[5] The mineral deposits are not only rich and of great variety, but so placed as for the most part to be readily accesible. Rarely does a country combine such mineral wealth with so fertile a soil.

There are nowhere more fruitful regions; and these, together with the vast forest and pasture regions, give her a varied and widely distributed industrial wealth. The cardinal facts involved in this distribution are, that no one section is self-sufficing, but dependent each section upon the other, for its maintenance as to food supply, raw materials for manufacture, and finished products; and that the distribution of these commodities de-

[1] Trotter, "Geography of Commerce," p. 1.
[2] Ibid., p. 6.
[3] Dodge's "Advanced Geography," p. 182.
[4] Ibid.
[5] Ibid., p. 182.

pends upon transportation facilities which are largely conditioned by topography. Owing to these facts there has, therefore, originated a movement of products from one region to another which has become organized into an extensive internal commerce, the bulk of which is made up of the movement of a few great staple products, grain, live-stock, cotton, lumber, fruits, coal and iron.

In comparison with the movement of these few staple commodities the carrying of manufactured products is a small item. As a result of these natural resources we have the fundamental or "extractive industries,"—agriculture, stock raising, mining and lumbering, that form the basis of our national prosperity, upon which the "outgoing" or foreign trade likewise depends,—whether the material be in a raw state or as a manufactured product. "The underlying principle of internal commerce is," obviously, "largely a physiographical one;—the diversity of products which characterizes the different sections of the United States"[1] being the result of contrasted physical conditions,—climate and soil, as well as the wide and varied distribution of natural resources.

Before passing to a brief review of her historical development, let us for a moment consider the position of the United States and the commercial opportunities offered by her natural highways. Situated across the smaller ocean from the leading nations of Europe, her large and commodious harbors, formed, in many cases, by estuaries and river mouths, stand like so many "open doors" inviting the products, men, and ideas of other nations from beyond her "subject sea" to her eastern and southern shores, to which, through the numerous water gaps and the natural highways of commerce the products of the country have been cheaply and rapidly sent for exchange and further transportation. The natural highways of commerce, the lake chains and rivers, have always been lines of travel, and trails formed originally along the lines of least resistance by various wild animals, as the buffalo and deer, have often been successfully followed at later periods by the Indian, frontiersman, pack horse, wagon road, and railroad.

In the early part of the nineteenth century, before the advent of the railway, these natural highways were supplemented by a large number of canals, built for cross-country navigation, and to connect the river and lake systems, thereby, obtaining longer and continuous water routes. To-day the railroad greatly supersedes the water traffic, but the rivers of the United States, the "roads that run" have served an important part in promoting her commercial greatness. A brief review of the historical development of the country, from the first, makes apparent the fact that consciously or

[1]Trotter. "Geography of Commerce" P. 132.

unconsciously the early settlers took advantage of and chose their places of settlement because of some one or more of the physiographic conditions which we have considered;—the matter of first consequence at the earliest stage was a good harbor for a "shelter in the time of storm."

It was not, as Professor Brigham suggests, in the opening paragraph of his book, "Geographic Influences in American History,"—to which I shall again have occasion to refer, a "new continent that Columbus and the early discoverers sought, but a new path to an old world" for the purposes of trade with the east;—in short, greater commercial opportunities. A foreign commerce with the newly discovered continent was soon opened. As early as 1500 European craft began to visit the cod banks of Newfoundland, starting an industry which was soon followed, at other points along the coast, by fur trade with the Indians. "The shores of the continent were discovered and explored by piecemeal, generally from the south northward, each explorer opening up a little longer vista of the coast line."[1] The Spanish pioneers were followed closely by English and French mariners each of whom at once claimed for his country those portions of the newly discovered land which he had either discovered or explored. The Spanairds held the islands and seas of the south; the French occupied the St. Lawrence; and, in 1585, the breaking of Spanish power through the destruction of the Armada opened the way for the English to share, too, in the colonization of the new continent. A narrow strip of lowland between the Appalachian Highlands and the sea, extending from the French to the Spanish possessions, was left to the Englishman who made his home by the rivers of Virginia,—the first permanant English settlement being at Jamestown, in 1607,—about Massachusetts Bay, on the Delaware, the Chesapeake, and on the low coasts of the Carolinas south to the Savannah. The Dutch before him took possession of the best Atlantic harbor at the mouth of the Hudson along which he found a narrow, but open and easy road through the Appalachian wall between the seaboard and the prairies. Finally, in 1674, this advantageous possession was wrested from the Dutch by the Englishman, giving him, thereby, at the close of the seventeenth century a series of English towns commanding the best harbors and natural highways of the Atlantic coast and plain. These scattered settlements, Spanish, French and English which skirted our eastern and southern shores and destined in many instances, at no distant future, to become great commercial centers of the United States and of the world, were, at first, quite independent of one another, but more or less dependent upon the mother countries. This is especially true in regard to the commercial relationship

[1] Gannett, "North America," I, p. 291.

that existed among the several English colonies. During the colonial period several efforts were made to unite the English colonies, but owing to their difference of origin, their wide spread separation,—for in those days distances were much greater than now,—geographic conditions, religion and social life there was but little sympathy among them, and many grounds for jealousies, until "breathings of discontent," heard many years prior to the actual outbreak of hostilities against a common enemy,—their mother country,— tended to bind them together for the purpose of resisting her tyrannical acts, many of which so materially affected their commerce. During the struggle for independence which followed, trade with the mother country was suspended and the colonies, to a greater or less degree, became dependent upon each other. Prior to the Revolution these colonial towns were, as has been suggested, markets where the country's new products were exchanged for the manufactured goods of England. They were essentially commercial, not industrial. Not until the close of the war, did the industrial phase of the country's development begin; and manufactures developed most rapidly in those parts of the country, during this industrial period, where from physiographic conditions the limited area of arable land felt the competition of other agricultural areas more favored by nature. New England more strikingly than any other section illustrates these conditions. Here we have an excessively glaciated surface with only a limited area adapted to agriculture, abundant water power, and a section of country accesible by sea to the outside sources of raw materials. For these reasons, therefore, the towns of New England became at an early date manufacturing as well as commercial, though their products were for a number of years limited in variety, simple in character, and formed but a small part of their exports. The Middle Atlantic Slope had not only those physiograhic conditions, which favored the early development of the manufacturing industry of New England, but, in addition, a situation in close proximity to the coal and iron fields so that here, as in New England, we find manufacturing interests early predominating. The southern section of the country remained for many years a purely agricultural region, and upon this and other arable regions, which were developed as the country became settled and agricultural interests expanded, the towns of New England and Middle Atlantic Slope depended for food supplies and raw materials in exchange for their manufactured goods. We have therefore, in the early part of the nineteenth century as a result of this industrial growth, or as its counterpart, in order of their development, a well established and growing, foreign, coastwise, and internal commerce, all most closely related to each other and the industrial

development, we have but briefly sketched. These commercial and industrial aspects, because of their close inter-relation, cannot be divorced. Now one aspect—now the other—predominates, or both may be equally strong, contributing—each, its part, to a seaport's growth. However, though many seaports of the United States reflect the advantages of a trans-oceanic market and of a coastwise trade with other parts of the American continent, we shall again and again have occasion to note, as we now proceed to consider separately the chief commercial centers of our sea coasts, that the relative development of these once colonial seaport towns depends, as formerly, chiefly "upon the productiveness and accessibility of the regions served by them, or, in a single word, upon their hinderland and the facilities which they afford to shipping."[1]

At the close of the nineteenth century, the chief seaports, in order of their importance as determined by the amount of tonnage entered and cleared in foreign trade were New York, Boston, Philadelphia, New Orleans, Baltimore, The Puget Sound ports, San Francisco, Galveston, Newport News, Mobile, Savannah, and Charleston.[2] Of these seaports, no one offers a greater opportunity than New York for a detailed study of the geographic influences that have contributed to their development. Here they are in unrivalled combination:—a magnificent harbor at the mouth of the Hudson River, a tidal estuary for a distance of one hundred and fifty miles;—over three hundred miles of wharfage and shore line;—steamship connections, not only with other ports up and down the Atlantic coasts, but with all the leading ports of Europe, South America and the West Indies;—connections with a great "hinderland," by natural and artificial waterways from which radiate railroads towards the western and southern states, vast in extent, rich in natural resources, and inhabited by a vigorous and energetic people. But, for her inland ways, New York might not have become, what she to-day is, the most important port in the country and the second largest city in the world, notwithstanding the perfection of her harbor. New York was surpassed as a seaport town by both Boston and Philadelphia until some years after the completion of the Erie Canal, conceived it is said by Gov. Morris, in 1803, who is reported to have remarked, "Lake Erie must be tapped and the waters carried across the country to the Hudson;"—considered by the legislature and surveyed in 1808;—finally opened between Lake Erie and the Hudson on Oct. 26, 1825, and paralleled in 1826, not only by what was the first chartered railroad in America, but also the first in a series of westward links, connect-

[1] Chisholm, "Handbook of Commercial Geography," p. 56.
[2] Ibid., p. 494.

ing New York and Buffalo and to-day known as the "New York Central and Hudson River R. R."[1] However, from the time when grain and other products of the interior began to float down the Hudson by way of the Erie Canal the race for New York was practically won, and she became, inevitably, the chief metropolis of the Western Hemisphere. Here ships could come and get a return cargo on her docks, a condition of affairs true of no other city in the United States. Philadelphia and Baltimore have no such *favorable* opening into the Mississippi Valley and Boston is beyond the Berkshire barrier.[2] Professor Brigham has condensed into one epigrammatic paragraph the transportation facilities of the Hudson-Mohawk valley as they exist to-day. He says, "To sum up, the valley is now threaded by the ancient highways, the Erie Canal, six railway tracks and innumerable telegraphs and long distance telephones by which New York converses with Detroit, Indianapolis, Chicago, and other Western cities. The passing up and down, day and night, of men, thoughts and commodities, is like the ebb and flow of tidal waves, whose course is only stayed as traffic rests on the docks of Europe and of more distant continents." He also points out in the same chapter that within the counties bordered or crossed by the Hudson River and Erie Canal are to be found four-fifths of the population and nine-tenths of the wealth of the Empire State!

Philadelphia, for a number of years the seaboard rival of New York, now, among the country's chief seaports third in rank, and situated by the estuary of the Delaware, has through natural highways, like New York, access to the Mississippi valley, though none, however, offer the superlative transportation facilities of the Hudson-Mohawk valley. This valley route has been and is a steady menace to the trade of Philadelphia, though during the early decades of the nineteenth century the men of Philadelphia thought they held the geographic key to the inland trade, and had many and varied schemes by which they went on rivers, lakes and short canals to the Ohio and surrounding country. However, New Yorkers, who, at the same time, insured the goods shipped, and gave easier terms of payment for transportation, held the advantage by way of the Hudson valley, which has well been called the "Gateway of the American continent," together with the Mohawk Valley, and "anticipated even better days, for the Erie Canal was then under way." Before the advent of the railroad, these briefly were the transportation facilities afforded by the "hinderland" of Philadelphia as compared with the "hinderland" of New York. Though the roadways extending from Philadelphia and the Chesapeake country were numerous, nature offered no commanding route by

[1] Brigham, "Geographic Influences in American History," pp. 20-26.
[2] Ibid., p. 26.

which the commercial supremacy of Philadelphia could be assured. What are the conditions since the development of the railway? First, and obviously, this, the Hudson-Mohawk Valley is still not the only route by which we may reach by rail the Mississippi Valley and the West, but it is a "broader gate with a lower threshold" than that offered by way of the Susquehanna. Secondly, none of the great railways by the more Southern routes pass the Appalachian belt at an altitude, as at Rome, N. Y., of 445 feet. And, thirdly, because the railroads south of New York must "cross difficult divides rise and fall between low altitudes and heights of nearly 1800 feet"[1] they are constructed and maintained at a much greater expense and rates of transportation are correspondingly high. These briefly, are the conditions which tend to limit the amount of traffic by way of the southern valleys and hence the opportunities of Philadelphia, for commercial growth. However, despite the fact that Philadelphia, now as formerly, appears at a disadvantage when we compare the geographic influences that contribute to her growth with those of New York, it is at once apparent, when compared with the other seaports of the United States, that her opportunities for industrial and commercial development are in no sense small. Situated, as we have said, on the Delaware, practically at the head of navigation, in close proximity to the iron and coal producing regions, she has become a great industrial center, important, especially, for the manufacture of carpets and rugs, woolen and worsted goods, and finished leather, together with the products of her foundries and machine shops. Philadelphia, because of her situation, is also a great coal exporting city particularly to the towns along the coast, though her foreign trade is considerable.

During the early stage of their development both New York and Philadelphia became anxious lest the farmers and traders of the "New West" send their goods to New Orleans and thereby favor her growth at the expense of theirs. That their fears were not without basis, her position today clearly shows. At the close of the nineteenth century, she not only ranked as the fourth chief seaport in the United States but had become the chief cotton exporting city in the world.[2] Her growth has been largely due to the industrial and commercial development of one of the most productive "hinderlands" in the country, abundantly supplied with natural highways for transportation, upon which the country depended, until the development of railways, by means of which the great bulk of traffic is now carried on. To-day four-fifths[3] of the products entering the city come

[1] Brigham, "Geographic Influences in American History," p. 25.
[2] Dodge's "Advanced Geography," p. 148.
[3] Adam's "Commercial Geography," p. 160.

from this interior by rail, river and canal. New Orleans, therefore, as the natural outlet of the Mississippi Basin and the focus of carrying trade lines in the Gulf has become one of the chief seaports of the country and promises to become one of the great exporting points of the world. "In 1901, she supplanted Philadelphia in the third place in the list of grain exporting cities being outranked only by New York and Baltimore. In the fiscal year ending 1902, her grain exports were 36 per cent. more than those of Philadelphia, and very nearly equal to Baltimore. The last two years have seen the total foreign commerce of the Crescent City increase 56 per cent." In regard to the other Gulf ports Miss Semple says,[1] "The steady industrial and commercial growth which has been going on in the Southern States in the past decade has been suddenly accelerated by our increasing interest in the Carribean Sea," and that the "balance of commercial activity" because of our closer relations with Cuba and Porto Rico is now tipping towards the Gulf seaboard. The evidence she says is to be found in the statistics of exports and imports of New Orleans, Galveston, Corpus Christi, Mobile, Pensacola, Tampa and Key West; and that the development of New Orleans may be further tested "by the eagerness of certain big railroad systems of the Mississippi Valley to reach New Orleans. This purpose reflects the existing trend away from the Atlantic seaboard cities towards the Gulf."[2]

The influence to be exerted by the Isthmian canal is already a matter about which there is much conjecture. Galveston, the only other Gulf seaport we shall consider separately, is an extremely important cotton port owing to her position near the great Texas cotton fields. Despite the disadvantages of a poor harbor, maintained at great expense, she has a large foreign commerce, especially with Germany and France. To appreciate the part the exportation of cotton has had, and is having, in the commercial growth of our Southern Atlantic and Gulf seaports, we need only to compare the production of the country as a whole, in the past and present, with the total amount produced. In 1791, the United States furnished less than one-sixth of 1 per cent. of the cotton importation of Great Britain, while in 1899, 80 per cent. of the world's supply was furnished by the United States.[3] Charleston and Savannah as the natural outlets of the agricultural products of the regions in which they are situated have become the two most important seaports of the Southern States of the Atlantic Coast. Because the coast is generally bordered by barrier beaches and the extensive lagoons formed behind

[1] Semple, "American History and its Geographic Conditions," pp. 417, 418.
[2] Semple, "American History and its Geographic Conditions," p. 418.
[3] XII Census of U. S., Vol. VI, Agriculture, Part II, p. 405.

them are too shallow to form good harbors, the trade of these seaports is largely with New York, Philadelphia, and Boston rather than with foreign ports.

To trace the geographic development of Baltimore is hardly necessary since it follows in the main that of Philadelphia, also a "Fall Line" city. Her situation at a point where the Patapsco river falls into the Chesapeake, in the midst of the agricultural region of the Piedmont Belt and Coastal Plain, from which products are sent for manufacture and shipment, together with her excellent railway connections with the North, South and West has made her a growing commercial center; notwithstanding, she is at a disadvantage in securing trade with regions lying west of the Appalachian Highland owing to the fact that her railroad to the West has to follow more difficult grades than the western roads centering at Philadelphia and New York.

The geographic influences that have contributed, in general, to the development of all New England cities, namely, cheap water power, transportation facilities, accessibility to regions producing raw materials, and population abounding in energy and inventive genius have already been considered. The manufactured products of many of these great industrial centers find an outlet by way of Boston, which is surrounded by no less than twenty cities, all of which are important in some line of manufacturing and within an hour's ride by rail. To these and all New England cities engaged in manufacturing, the raw products of the South and West must be brought. Boston's railway facilities and situation on one of the finest harbors in the country have made her one of the chief receiving and distributing ports for these raw materials. She has not only an extensive coastwise commerce with New York, Savannah, and the West Indies but is also connected with the large cities of Central Massachusetts and the West by two railroads which bring great quantities of wool, cereals, and provisions,—a part of which is exported to Europe. These influences that have been most instrumental in making Boston the chief commercial city in New England and next to New York in rank, have in the main been the most vital factors in the development of all other New England seaports.

The commercial cities of our Pacific coast have developed upon the only two great inlets to be found throughout the entire length of Washington, Oregon, and California. These seaports owe their growth chiefly to the fact that they are situated at those places most convenient for the exchange of products of the "East" and "Far East." "Each of the cities which have developed on these inlets has transcontinental connection with the produc-

ing and consuming areas of the East and through them pass the products of the Far East." The recent development of our Pacific Coast ports is chiefly due to the increase in commerce with our Pacific possessions and the greater ease in getting to Asiatic shores, though trade with Yukon has contributed much to the growth of Seattle. San Francisco, the chief city of the coast, is situated on the best harbor, is connected with eastern cities by several routes and with the Pacific ports of the Old World by many steamship lines. She owes her rapid growth in the "fifties" to the ready entrance she furnished to the gold mining region,—the river valleys on the western side of the Sierra Nevada,—in 1849. In less than eighteen months after the discovery, California had a population of not less than 1,000,000 and San Franscisco in the meantime increased from 2,000 to 20,000 people.[1] Since 1880 the most notable changes in the seaports of our Pacific coast are the decline in the position of San Francisco and the rise of the Puget Sound Ports if the amount of tonnage entered and cleared in foreign trade is considered.[2] This relative decline in foreign trade in the case of San Francisco is ascribed to the "increasing importance of steamer as compared with sailor traffic and the concurrent development of transcontinental railway traffic. These circumstances have combined to draw away much of the trade of the hinderland of San Francisco to competing Atlantic ports." The rise of the Puget Sound ports is attributed "chiefly to the development of Alaska and the Yukon fields."

It has been no part of the plan of this paper to give statistics of commerce concerning the development of the seaports of the United States, but rather in the light of general principles and brief outline of the country's historical development to show some of the laws and centers of their growth. The relative importance of the two elements, man and nature, included in the term "geographic," and the result of the interactions which are, as we have seen, an outcome of their relationship to each other, have been admirably summarized, in the case of the United States, by Miss Semple. She says: "The vast size of the home country affording a wide field for raw materials, for concentration and hence organization of industries, for development of transportation facilities and maintenance of an extensive and varied domestic market has been in the past the dominant factor in the evolution of American commerce. The other factor has been the Anglo-Saxon vigor of character and tenacity of purpose. Here heredity and environment have combined to do their utmost and the result has not been small.

[1] Gordy, "A History of the United States." I, page 296.

[2] Chisholm, "Handbook of Commercial Geography." I, page 494.

"The United States is to-day the world's greatest producer of manufactures, and as an exporter of domestic products it ranks side by side with Great Britian. The Atlantic has given us near access to Europe and the 'American invasion' has followed. The Pacific has opened to us though at longer range the markets of the Orient and the flag has been set free upon the outlying fragment of the Asiatic continent.

"Enthroned between her subject seas, the United States has by reason of her large area and her geographical location the most perfect conditions for preëminence in the commerce of the world ocean."[1]

AN IDEAL COMMERCIAL HARBOR

THE ideal commercial harbor probably finds its nearest approach in that of New York. It is a closed river harbor in a drowned valley. It is not obstructed by ice. A great river gives a highway to the interior, and with its deep and widened mouth, half estuary, half bay, holds enough water to enable a moderate tide to scour and keep open a sea entrance with but little dredging. Further than this the river is (and for an ideal harbor must be) wide enough to permit piers to be built out into the stream at right angles to the shore. By this means the space available for ships along a given amount of shore line is increased more than fivefold.

If a river, otherwise usable, is too narrow for piers, the vessels must lie in single row lengthwise along the shore. Upon this extravagant use of shore line no commercial city can depend entirely, because the ships that carried its commerce would be compelled to stop miles down stream to find shore space to unload and receive cargo. The Maas at Rotterdam is five hundred and forty yards wide, and the Elbe at Hamburg is little better; while the Hudson at New York and the Delaware at Philadelphia are each nearly a mile in width. A comparison of the maps of the harbors of Hamburg and Rotterdam with New York and Philadelphia will show at a glance the amount of work that man has been compelled to do because of the narrowness of the two European rivers. Instead of piers going into the stream seven hundred feet as in Philadelphia, a single row of ships lies lengthwise along the shore, and artificial harbors hundreds of acres in extent have been dug in the adjacent meadows to enable the shipping to be accommodated within the port.—From *The Organization of Ocean Commerce, by J. Russell Smith.*

[1] Semple, "American History and its Geographic Conditions." P. 434.

WHAT IS GEOGRAPHY?*

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TO the educated mind confusion is always annoying. Its effort is toward definite conception and clear thinking. The progress of human knowledge is accomplished not alone by the discovery of new facts, but quite as much by the comparison, classification and orderly arrangement of all facts. This tendency to classify and define, to bring order out of chaos, is so fundamental that we often draw sharp lines of distinction where they do not exist in nature. If we undertake to divide our acquaintances into good and bad, smart and dull, handsome and ugly, tall and short, young and old, there will always be a certain number which are intermediate and do not fall into either class. If we decide to form a third or intermediate class our difficulties are doubled, because we have then to draw two dividing lines instead of one. If we accomplish the task it will be by making some artificial and arbitrary distinction. This is true in every department of human thought, and in none more so than in the definition of the various sciences or subjects of study. The attempt to erect a wall around the field of any science, to keep its contents absolutely separate from all other sciences, may as well be abandoned at the outset. The best that can be done is to find a central view point from which the field stretches away in every direction to a dim and indefinite horizon.

It is a notable fact that doubt, discussion and controversy concerning the limits of a science seldom arise among the men who are actively engaged in creating and perfecting it. The astronomer, the chemist, the botanist, are each too busy in cultivating the field which clearly belongs to him to waste time in debate over the border lands. He knows that his field overlaps those of his neighbors, that their fields overlap his and that there are wide areas held by all as tenants in common. The unity and interdependence of all science underlies and makes possible the division and specialization of sciences.

And so the question, What is geography? is a question of academic rather than of scientific interest. It is discussed much more among schoolmasters than among geographers, and the fact that it has been agitated most by those less fitted to decide it has contributed largely to confusion and disagreement. Who is so competent to say what botany is as the bot-

*Abstracted from an address before the Southern Illinois Educational Council, and printed in the *Teachers Journal*.

anist who knows the science from the inside, and by personal work and experience has helped to create it? Is not this right generally conceded to him? Have you ever heard of a school teacher or superintendent or professor of pedagogy who undertook to define botany, or chemistry, or physics unless he was at the same time a reasonably expert botanist, chemist or physicist? Every science should be defined and organized by its own workers, by the men who have the most intimate knowledge of it, and no outsider has a right to be heard on the subject.

Here lies the trouble with geography, and the reason why we are still discussing its central idea, the limits and content of its subject matter, the number and nature of its divisions and their organic relations to one another. Geography in the schools has, as a rule, been defined and organized by people who were more interested in teaching than in the science itself. Hence the discrepancy between geography "as she is taught" and the geography of the geographers. It is the province of the pedagogue to take a science as he finds it and to determine what portions and aspects of it are most important, most profitable, most available for school instruction in various grades and conditions, and in what order and by what methods these ought to be presented to students. To do this well the pedagogue must have a broad view and some first hand knowledge of the subject. The only persons who have a right to an original opinion as to what geography is are the scientific geographers. A review of the birth and development of geography and an examination of expert opinion upon the subject will go far to clear up confusion, to end discussion and to show that there is reasonable agreement upon this much mooted question.

The dictionary tells us that the word *geography* means earth-description. Before a thing can be described it must be known; therefore geography implies a knowledge of the earth and of everything that belongs to it, from the unfathomed depths 4,000 miles below us to the unfathomed heights of the upper air, perhaps as many miles above us. Geography would thus divide with astronomy the whole realm of physical science, the one dealing with all the heavenly bodies in the universe, the other with this one terrestrial body upon which we live. Primitive geography had this broad scope, and traces of it have not entirely disappeared from text-books still in use.

"The foundation of geography," as Bain puts it, "is the conception of occupied space." Not only men but most animals have some consciousness that they occupy space, and that other objects have certain space relations to them and to one another. That sense of locality, direction and distance which many animals possess is of the very essence of geography. The

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squirrel has an intimate and practical knowledge of the geography of his hollow tree, the ant of its nest, the bee of its hive, while migratory birds extend their geographical knowledge across continents and zones, from Hudson Bay to Mexico and from Norway to Africa. The beginnings of geography are not only prehistoric, but prehuman. Primitive man learned the same kind of geography as the animals and in the same way. His very existence depended upon his knowing where he could find food and water, a cave or thicket for shelter, what roots and fruits are nutritious or poisonous, what animals he could use for food, and what animals could make a similar use of him. He was compelled to become acquainted with his surroundings. Every child to-day and forever must acquire the same knowledge in the same way, by personal exploration. To understand what geography is at the bottom it is necessary only to watch a bright and active child as he makes himself acquainted with his environment, whether it be a room, a door-yard, a farm or a city square. It does not take him long to find the way to the book case, the flower bed, the brook, the calf pen, or the candy store.

Geography primarily involves in the mind a sense of space relations with other objects, a consciousness of surroundings, a knowledge of some portion of the face of the earth and its contained features. The everlasting geographical questions are concerning any feature, Where is it? concerning any region, What is there in it? concerning any creature, What are its surroundings? Locality, contents, environment, constitute the subject matter of descriptive geography. * * * * *

It will hardly be questioned that geography includes in its subject matter, the following topics:

1. The earth as a planet: its form, dimensions, motions and relation to the sun.
2. The land: its outline and relief: the distribution of its surface forms including streams and lakes.
3. The sea: its outline, depth and contents: the properties and movements of sea water.
4. The atmosphere: its properties, conditions, and movements and their results as manifested in climate.
5. Plants and animals: their distribution.
6. Man: the distribution and movements of peoples: human conditions, industries, structures and to some extent institutions.

However elementary or exhaustive may be our knowledge of any of these groups of the phenomena the science of geography must consist in a synthesis of all of them, in a study of their relations to one another. Com-

pare with this the scheme of organization insisted upon by many eminent educators in this country. Prof. Charles A. McMurry says: "Geography is the study of the earth as the home of man. The study of the earth alone; its phenomena and forces, its vegetation and animals, its rocks and atmosphere, is natural science, pure and simple. The study of man in his work and progress in his struggles and representative deeds, is history. The study of the earth as related to man is geography." This seems to be a statement of the Ritterian view, in its extremist form. According to this view, if the student studies the rocky frame of the globe and the effect of the atmosphere upon it, the process of weathering, degradation, erosion, he is not studying geography at all unless he considers them in their relation to human life, activities and institutions. According to the principles which prevail in all other "natural sciences pure and simple" he is studying the anatomy and physiology of the earth, which form the foundation chapters of geography, the first links in the chain of the geographic argument. If he never goes any farther, never brings human affairs into consideration, he has still been studying, not the complete round of geographic science, but a very important and essential part of it.

It is difficult to see what reason there is in the nature of things why the relation of the land to the sea and the air, the air to the sea, plants and animals to land, sea and air, are not as much a part of geography as any other relations; or if they are not geographical, to what science they do belong. It is also difficult to see why geography should be exclusively a human science any more than chemistry or geology. How would it do to define chemistry as the science of the relations between man's institutions and the composition and specific properties of bodies? or geology as the science of the relations between man's institutions and the life history of the earth?

Evidently the number of relations which exist between the phenomena of the same group and between the different groups themselves is very large, probably beyond the capacity of any one mind to grasp. But there are a few major relations which include the minor, and which can be made clear to primary students. These are the relations of land masses and ocean basins, the relations of relief and climate, and the relations of man to his whole physical environment. They form a cumulative series of increasing complexity everywhere traversed by other threads of relationship growing out of the phenomena of the earth as a whole. These form the "connected chain of geographical argument of which the earth's surface and man are the terminal links," the bridge which connects the purely natural sciences with the humanities. It is evident that the human relation is but

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one out of many links in the chain, yet it is the last link, the crowning relation, without which the argument is incomplete, and its largest meaning missed. If an intelligent inhabitant of Mars had paid a visit to the earth before the advent of man he would have found enough material for a science of geography to occupy him during several centuries. He would have found the round earth, lighted and warmed by the sun, diversified by oceans and continents, mountains and rivers, and inhabited by a million forms of life. If he had observed the distribution of all these, and had discovered and recorded their relations, would he not have been a great geographer? Yet man would have been unmentioned and unknown. If a man should accomplish a similar task to-day, or any considerable portion of it, even though he should omit all consideration of human affairs, could we deny his claim to the title of a geographer?

The innumerable facts which modern geography holds in solution may be crystallized along the thread of distribution, or mutual dependence in space, and this is the normal and legitimate development of the science from its primitive and popular form. That this is the view which prevails among eminent European geographers is evident from the following formal statements. Probably the most authoritative definition of geography ever made was formulated by the International Geographical Congress at Venice in 1881. It is not so clear and concise as an American educational committee would have made it, but it manages to say that "geography includes the study of the surface forms of the earth and the reciprocal relations of the different branches of the organic world," and is distinguished from other sciences by "indicating the distribution of beings, organic and inorganic, upon the earth."

Professor Hettner of the University of Leipsic, wrote in 1895: "The geography of to-day starts from the point of view of diversity in space, and aims at a scientific explanation of the nature of regions, inclusive of their inhabitants. Its task is to investigate the distribution of phenomena in mutual dependence."

Professor Neumann of the University of Freiberg, has recently declared as follows: "General geography deals with the general laws of the distribution of every class of phenomena on the earth's surface. Special geography describes and explains the various countries in their characteristic peculiarities of land and water forms, climate, vegetation, animal life, human settlements, and their conditions of organization and culture."

Professor Ule of Halle, defines the scope of modern geography to be "the investigation of the reciprocal effects of the several phenomena of a country, and their causal connection."

Mr. Mackinder of the University of Oxford, says "distribution is of the essence of geography."

Mr. Scott Keltie says: "Geography is the science of the topographical distribution of the great features of the earth's surface, and of all that it sustains, mineral, vegetable and animal, including man himself."

Prof. H. R. Mill, in his introduction to the International Geography, a recent work produced by the collaboration of seventy different authors from all parts of the civilized world, publishes the following formal definition which presumably bears the approval of his colleagues: "Geography is the exact and organized knowledge of the distribution of phenomena on the surface of the earth, culminating in the explanation of the interaction of man with his terrestrial environment."

If it be desirable to condense all these views into a concise formula, perhaps none better can be found than this: Geography treats of the distribution of all terrestrial phenomena in mutual dependence. Or to crowd all possible meaning into the word 'science,' *geography is the science of distributions.* If this be too indefinite by reason of brevity, it may be expanded by specifying that geography is the science which deals with the mutual relations of relief, climate, and life. This is essentially the same thought which Guyot expressed more figuratively when he said that geography views the earth as a living organism.

The field of geography then is the face of the earth, or that thin shell which includes the surface of the land, the lower portion of the atmosphere and the whole of the sea; for it is only within this shell that all the geographic factors, land, water, air, plants, animals and men exist and react upon one another. The business of geography is first to determine accurately the distribution of each and all of these factors; and second, to discover the causes which have brought about the distribution of each; and third, to explain the relations of each factor and group of factors to all the rest.

The development of geography has been traced through two stages: (1.) the descriptive, and (2.) the scientific. The descriptive stage consists of an accumulation of facts, an inventory of the large features of the face of the earth. Its results are best expressed by means of maps showing the distribution of land and water, relief forms and drainage systems, temperature and rainfall, forests and prairies, steppes and deserts, people and nations, cities and towns, roads and sailing courses, products and institutions. These must always form the foundation courses of geography. The descriptive stage is not yet completed, and is not likely to be soon. New discoveries are being made every day, not only in the less known regions, but in those which have been most thoroughly studied.

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In the scientific or explanatory stage geographic study is extended to other relations than those of position and to the causes which have brought about the distribution of features and phenomena shown on the maps. This stage is now in the full tide of progress and its completion lies in the indefinite future. The teacher who would himself receive and give to his students the best fruits of geographic study must not shrink from any portion of this task. It is not enough to learn where the Appalachian mountains are, their trend, length, breadth and height, but it is equally the business of geography to know how they came into existence and why they possess the peculiar characters which distinguish them from other mountains. It is not enough to describe the Mississippi river, its course, length, volume and tributaries, but the causes and conditions which make it what it is, must be attacked. It is not enough to know the names, locations, areas and connections of the Great Lakes, but how their basins came to be there must be explained. This is as essential to good geography as their relations to commerce. It is not enough to say that Chicago is a city of two million people near the head of Lake Michigan, but the question, what made it grow to such dimensions? must be answered. This principle must be applied to all geographic features alike. The causes of plains and plateaus, valleys and mountains, lakes and waterfalls are as much a part of scientific geography as the causes of night and day, winter and summer, winds and rains, waves and currents, farms and factories.

Geography is now entering upon a third stage of development which promises to carry the science on to a higher dignity and value. In the time at command I can only briefly and imperfectly indicate its character.

According to a theory once very popular, an omnipotent creator had, for his own amusement or glory, made out of nothing a mass of earth, water and air, whether round or flat was of trifling importance, had suspended it in space, had made sun, moon and stars to revolve around it at various distances and speeds to throw their shifting lights upon the mundane stage, had provided a vast array of scenery and properties, and had placed upon it a motley company of actors to play, each for one night only, the drama of life. Among these the bright consummate star was man, for whom the whole play, with all its leading and subordinate parts, supporters and supes, settings and costumes, was especially designed. In fact, man was the only real actor, the rest being little more than marionettes, wire-worked puppets, under the mechanical control of the stage manager. This theatrical statement is something of a caricature, but it serves to exaggerate and bring out one characteristic, that the relation between man and his surroundings, as well as between the various elements of the surroundings

themselves, was conceived to be as purely mechanical as that between the actor and the stage setting. This theory, of course, assumed in different minds and times various degrees of childish crudity and philosophical refinement, but this one element of mechanical arrangement of parts, was never absent.

But since the days of Copernicus and Galileo our knowledge of the starry heavens has widened until we no longer think of the universe as made for man or man for the universe. We no longer think of the earth as merely a stage setting for the play of human life. The stage has not been arranged by the manager for the actors, but the actors have been fitted to the stage. They are what they are and no other, where they are and not elsewhere, and playing each his own peculiar part, because they have been molded, trained and adapted by means of that particular scene and part. The metaphor of the stage here breaks down and may be finally abandoned. Everything on earth, from a butte to a beetle, from a pebble to a pope, is in a large sense, the product of its environment. No one has put the case more clearly than Redway: "Indeed it would not be a very great breach of truth to say that a camel is a camel because of the desert; a fish, a fish because of the water; a bird, a bird because of the air;" and he might have added, a man, a man because of the world he lives in. The evolutionary interpretation of nature has wiped out of scientific minds the last vestige of the mechanical theory of the universe. It still lingers in some schools. The environment has not been adapted to man, but man has become partially, but still imperfectly adapted to his environment.

Professor Ratzel, acknowledged to be the greatest modern master of geography, does not hesitate to call the earth a vast workshop in which all living creatures, including man, have been constructed. "The predominant position which man occupies," he says, "is possible only on this earth and under these natural conditions, and therefore the earth has a far deeper significance in the history of mankind than it would have merely as the ground upon which men walk and labor and in which their graves are finally dug." Man appeared as the child of the earth and the earth mother has brought him up by means of a struggle with all her forces and creatures.

According to this view, the earth is not only the home of man, but the factory in which he has been made, the garden in which he has grown, the school in which he has been educated. The doctrine of evolution has laid its hand upon geography and is transforming it, as it has transformed every other subject of human study.

Environment is not responsible for the whole of anything, but for a part of everything, and nothing can be understood apart from the environment.

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Hence the explorer and the map maker, with their completed description and schemes of distribution, have not attained an end but achieved a beginning, have laid a foundation upon which the true geographer may build his science of the relations of every feature and creature to its environment. Distribution, although still essential is ceasing to be the central idea of geography, and the light of the science is being focused upon environment.

The vast importance of physical environment is beginning to be appreciated and the whole scientific world is turning to physical geography for a solution of some of its greatest problems. We find the botanists of late paying a great deal of attention to ecology, which being interpreted, is the science of dwelling places. They find that certain groups of plants, which differ widely in every other respect, are in the habit of living together peacefully in localities of a certain character. For instance, the shallow water around the edge of a pond is filled with submerged plants like the water lily. A little higher where the ground is less deeply covered with water, other groups like cattails and reed grass, flourish. Outside of these in very damp soil is a thicket of willows and alders, and around this in soil a little more dry, grow trees like the elm and soft maple, while a dry sand ridge near by is covered with scrub oak. Evidently this ring-within-ring arrangement of vegetation is determined by the amount of water in the soil, that is by the physical environment of the plants. The zoologists are discovering that physical conditions exert a similar control over the distribution of animals, and so a new branch of science, geographical biology or biological geography, is coming into existence. The physicians have discovered that malarial fever and yellow fever are dependent for their propagation upon certain species of mosquitoes. No mosquitoes, no fever, and so the geographical distribution of mosquitoes has become a burning question in medicine, in commerce, and in politics. Malarial fever is the chief obstacle which has thus far prevented civilized men from colonizing and occupying the tropical regions. If malarial fever can be wiped out by destroying the mosquitoes, a large and extremely valuable portion of the earth will be thrown open to civilization and will support a dense population.

* * * * *

However simple a thing may be, its environment is sure to be complex, and in dealing with the science of environment, subdivision and organization at once become necessary. The smooth round pebble on the beach is the product of the waves which roll it over and over against its neighbors a thousand times. A volcano may be said to be wholly the creature of its environment, of the internal forces which have acted beneath to build it up and of the air, frost and rain which are tearing it down. But

the most complex, important and interesting results of environment will be found among plants, animals and men. Professor Davis has recently proposed to define geography as the relation between the earth and its living inhabitants, between the physical environment and the environed organism. That part of geography which deals with the physical environment and is familiar to us all under the name of physical *geography* he would call *physiography* and for that part which deals with the environed organism he proposes the name *ontography*, reserving the name geography for the grand combination of the two.

In the First Year Book of the National Society for the Scientific Study of Education, he elaborates this idea with a philosophic grasp of principles and great wealth of illustration. "Thus understood," he says, "geography involves the knowledge of two great classes of facts; first, all those facts of inorganic environment which enter into relationship with the earth's inhabitants; second, all those responses by which the inhabitants from the lowest to the highest, have adjusted themselves to the environment. Neither physiography nor ontography alone is geography proper, for geography involves the relation in which the elements of its two components stand to each other."

The relations involved in geography, as thus understood, are extremely numerous and varied and many of the large and more general relations have long formed familiar items in the geographical stock. The relation between the irregularity of coast lines and the civilization of peoples, the relations of population and industries to rugged sea-girt New England, to smooth fertile prairies, to the arid plateaus of the Great Plains, and to the deserts of the Great Basin are standard geographical problems. But there are innumerable smaller details of relationship which belong to geography. I have compiled partly from Professor Davis's article the following list:

The rotation of the earth producing day and night, controls short periods of activity and rest, while the revolution of the earth and the inclination of its axis, producing the seasons, control long periods.

The size and density of the earth determine the force of gravity, to which the strength and rigidity of plant stems and the skeleton and muscular system of most animals have become adjusted. Only fish and other aquatic animals buoyed up by the water, escape this condition and are constructed on a different plan.

The absorption of carbon dioxide by plants for food and the respiration of oxygen by plants and animals are responses to the omnipresence of air; as also are organs of hearing and voice. The upward growth of plant

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stems and the organs of sight in animals are responsive to certain portions of solar radiation.

Mountains are barriers to the migration of plants, animals and men, which men have overcome by following stream valleys up to passes, by tunnels, zigzags and switchbacks. Mountains are often inhabited by the sweepings of the plains, while difficulty of communication, sparseness and isolation, lead to lack of progress or degeneration, as well as to love of liberty, independence and freedom from social vices.

The contrasts between the inhabitants of an island in the ocean and those of the surrounding waters is obvious, but no greater than that between the inhabitants of a lake and those of the surrounding land. An isolated group of mountains, like the Black Hills, presents an almost equal contrast with the surrounding plains. These elevations bring rainfall, which brings forests: denudation exposes veins of ore, and forests and mines bring population.

All creatures must adapt themselves to the available food supply: therefore in the South Sea Islands men live upon cocoanuts, in Greenland upon blubber, in North Africa on dates, in Indiana on beef, pork and cereals.

The earth worm gets food from the humus of the soil, the deep sea fish from the organic matter in the bottom mud, the supply of which falls through miles of water from the plant life on the surface. Many birds live upon insects caught only on the wing in the air, some upon fish or submerged plants for which they dive. Bees are so specialized as to depend upon the nectar of flowers.

In the matter of shelter again physical environment controls. There are brush huts in the jungle, grass huts in the savannahs, dug-outs and sod houses on the prairies, log houses in the timber, skin tepees on the plains. In China people excavate houses out of loess bluffs, and here martins have holes in sand banks. Men and beasts use rocks, crevices, caves and overhanging ledges. The muskrat and beaver build houses in the pond; woodchucks, gophers and prairie dogs burrow almost anywhere. Squirrels and wood-peckers use dead or hollow trees. Wasps use mud, and birds an endless variety of material for their nests.

A land covered with ice and snow has made the Esquimaux good sledgers and kayakers, and a land covered with dense forest has made the natives of equatorial regions expert canoe-men, the rivers being the only passable roads. The location of roads between neighboring villages on a plain, or a ford, bridge or ferry, of railroads along stream valleys, of trestles and tunnels through mountains, of ship channels in harbors, paths beaten down by wild animals in a jungle, trails worn by cattle to watering places,

the lanes followed by herds of pillaging ants, are all equally good examples of the control exerted by physical environment over living creatures.

The fleetness, endurance and venom of desert animals are in direct response to the hard conditions of life there. Cattle cannot live in certain parts of Africa on account of the tse-tse fly, and white men can hardly live there on account of the mosquitoes which transmit malarial fever.

These are a few, taken almost at random, of the endless variety of examples of the control which physical environment exerts over the structure, habits and lives of plants, animals and men, and of the response or reaction which the living creature has been obliged to make. In every case the creature has taken advantage of some condition of its physical environment, has become especially adapted to that, has survived and continued its race. Those who failed to respond effectually and to take advantage of some condition, have disappeared in the struggle for existence.

These relations are all geographical, and I like this kind of geography. It stands upon solid ground and may lift its head as high in the air as any one cares to build it.

If you asked me to come here to talk about, "What is Geography?" expecting me to give a simple, direct, and authoritative answer to the question, you have been disappointed. I hardly think that any man or body of men is in a position to do that at present. I can only say that geography has passed through a long period of development and the end is not yet. In the early stage it was a description of the earth. In the scientific stage which now prevails everywhere outside of some schools, it is "the exact and organized knowledge of the distribution of phenomena on the surface of the earth." In a third evolutionary stage which is just beginning it is, "the relation between the physical environment and the environed organism, between the earth and its inhabitants." This third and perhaps final stage of geography is based "not upon the old doctrine of the adaptation of the earth to man, but upon the modern evolutionary principle of the adaptation of all the earth's inhabitants to the earth," and the definition of the future may come to run something like this:

Geography is the science which deals with the distribution of every feature and the environment of every creature on the face of the earth.

Like every other science, geography is dependent upon its sister sciences, as they are dependent upon it. At every turn it calls upon physics and chemistry, for they alone can tell of the intimate properties of the matter with which it deals. Biology is equally dependent upon them, for they are the substrata of all natural science. The relations between geography and astronomy are intimate because the earth is one of the heavenly bodies and has relations with the rest. Their relations have always been peaceable

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and coöperative. Some portions of pure astronomy, such as the names, sizes, distances and motions of other planets, have occasionally strayed into geography, but they are disappearing. Confusion here is absurd. That the sun emits radiant energy is a fact of astronomy; that the energy is distributed over the earth in the form of heat and light is a fact of geography.

The largest overlap lies on the side of the other earth-science, geology. A wide domain of phenomena belongs to both sciences equally; but the spirit and purpose of the two are different. The aim of geology is to determine the life-history of the earth—the method of its creation in time—of geography to determine the present distribution and relation of earth features in space. "One reads the past in the light of the present, the other reads the present in the light of the past." The geologist is absolutely dependent upon geography for a knowledge of present features and processes, by which alone he is able to read the past history of the earth. The geographer cannot understand present features without knowing something of their history. The field of the geographer is the face of the earth, but he does not hesitate to go inward to the center, or outward to the remotest star, if he can find anything there which will help him to understand geographic features. Geology and geography are twin sisters which vie each with the other in offices of mutual help.

Geography and biology have similar relations. When the biologist studies the relations of plants and animals to soil, water, air, and climate, he is studying the geographical side of biology, and when the geographer studies the distribution of plants and animals, he is studying the biological side of geography. There is no occasion for contention or quarrel over boundaries which do not exist, but opportunity for friendly rivalry in a contest as to which can help the other most. And so it is with the relations between the geographer and the anthropologist, historian, political economist, statesman. Everything knowable has an environment and consequently a geographical phase. Human knowledge is not divided into a certain number of thought-tight compartments. As knowledge increases old dividing lines shift and fade or break down altogether and permit their contents to coalesce like two drops of water.

As Mr. Mackinder suggests, the different sciences are only different standpoints "from which to view, to analyze, and to group the facts of existence." A tree, a house, a mountain, a landscape, presents a very different appearance from different standpoints. Some features and relations are best seen from one standpoint, some from another. The most complete knowledge is gained by observation from all possible standpoints. All the sciences in existence and the many more which are sure to come, are but so many different standpoints.

EDITORIAL

THE UNITED STATES TOPOGRAPHIC MAPS

ATTENTION is particularly called to the announcement in this number of the increase in the wholesale price of the United States Geological Survey Topographic Maps. These maps are so necessary a part of every high school, normal school and college equipment in physical geography that wider and more conspicuous notice should have been given of a change in policy affecting educational geography so materially.

The topographic map of the home locality should be familiar to every child living in a region which has been mapped. It should be in every home in the locality as the best local reference map and a copy should be hung in every school room. These maps deserve wider use in the lower schools as reference maps and as classroom maps for careful study. The maps are easily understood, if carefully studied, and are not beyond the powers of sixth grade pupils, if properly presented.

Yet many teachers are ignorant that such maps exist and approach the study of them with trembling and fear.

Any map is to many people worse than a Chinese puzzle, and topographic maps are to them impossible. This is not as it should be and our elementary schools should make the use of these maps familiar to all. If one of the purposes of school work is to make a better living possible, then training should be given in those things that make the home locality a better living place. Certainly every one ought to know the geography of his home locality and how to use that locality as a basis with which to compare other localities. The topographic maps can and should be used for these purposes. The United States Government is making some of the best, cheapest and most usable as well as valuable maps in the world. These maps should be taught to every child possible that the next generation may be trained in how to make use of available and cheap and accurate reference materials. Hence the use of the local topographic map should be taught to every child possible that he may know of its existence, know how to use it, where to get it and become so familiar with it that he cannot get along without it.

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RECENT PUBLICATIONS

A Laboratory Manual in Physical Geography. By Frank W. Darling. Atkinson, Mentzer & Grover, Chicago and Boston, 1905.

A revised and supplemented edition of the author's former manual, prepared for use in the Chicago High Schools. Arranged in note book form with maps, note paper and section paper. Practical and devoted to exercises in physical geography —to be said of few other laboratory guides. To be reviewed later.

Commercial Geography. By Henry Gannett, Carl L. Garrison and Edwin J. Houston, pp. 415. American Book Company, New York, 1905.

A "text-book" to be "learned" more than to be studied. Gives more attention to financial and social side of commerce than is customary in text-books. This, together with the diagrams and most excellent index are strongly to be commended. To be reviewed later.

Year Book of the Department of Agriculture, 1905. Government Printing Office, Washington, D. C.

A source of much geographic information of value to teachers. The following articles may be noted in the current volume:—Relation of Weather Conditions to Growth and Development of Cotton; Agricultural Development in Argentina; The Castor Oil Industry; The Weather Bureau and the Home Seeker; Cotton Culture in Guatemala.

CURRENT EVENTS

SEEKING THE NORTH POLE

It is in the American character to admire courage, persistency, and patriotism even when their practical results are not adequate. In the attempts of American explorers to reach that particular point in the Arctic regions farthest distant from the Equator, it is admitted that the successful accomplishment of this ambition would not now aid commerce, would not materially increase our knowledge of geography, and would yield probably but meager scientific data. But every one sympathizes with Commander Peary as he once more enthusiastically takes up his chosen task of trying to place the American flag further north than that of any other nation. Certainly no one could possibly deserve success more than does Commander Peary, who has spent a large part of his active life in planning feasible ways of attacking the problem, and has endured all that man can endure and live in his repeated efforts to carry those plans out. He now has for his seventh expedition a fine new ship, the Roosevelt, built for the express purpose and with all the special forms of construction which experience has shown valuable in fighting ice. He will take on board of the Roosevelt when he reaches high latitudes a company of Eskimos specially chosen and well known to him, and with them and his crew of about twenty will sail as far north as he can get along the shore of Grant Land. Here his ship will probably be frozen in about the middle of September, perhaps 450 or 500 miles from

the Pole, and he will spend the greater part of the Arctic winter in preparing for his final dash north. His point of departure he expects to be somewhere about latitude 83°, and when the twilight of February makes traveling possible he will start thence with a very small company and move rapidly forward (ten miles a day is rapid traveling in that region), until the five hundred miles or so to the North Pole have been traversed or failure and return became inevitable. This plan is as simple as it can be made, and Mr. Peary builds his hopes of success on the strength of his ship and his knowledge of the Eskimos and of sledge work. Thus he declares that he knows the very men among the Eskimos who will follow him as far as he will go, and he knows equally those who will quail in the face of disaster. The party will have from twenty to twenty-five sledges, drawn each by six or eight dogs; each sledge will carry about five hundred pounds, including the weight of the driver. Mr. Peary says that he will depend for food almost entirely upon pemmican, ship's biscuit and tea, and that experience has shown these to be far the most effective articles of food and stimulus. It is said that no less than four thousand lives, two hundred ships, and $100,000,000 have been expended in the efforts to reach the North Pole. It is fair to admit that in the past at least valuable geographical and other scientific knowledge has been added in this way, directly or indirectly, to the world's store of information. This year there will be four expeditions in the Arctic regions. Two of them are of American origin, one French, and one Norwegian. Mr. Peary's expedition is the only one of these which starts from Greenland, and the general impression among students of Arctic exploration is that he has a better chance of success than his competitors. It will be remembered that the present record of "highest north" belongs to the Duke of Abruzzi's party, which in 1900, under Captain Cagni, planted the Italian flag at the latitude of 86° 33′—an advance of only a score or so of miles beyond Nansen's attainment.

THE NORWEGIAN SITUATION.

The conditions demanded by Sweden from Norway as a condition of recognition are now under consideration. The new nation is still in search of a king. King Oscar's refusal to permit any Bernadotte prince to accept the office is certain to be respected, and Norway turns naturally enough to Denmark. The alleged offer of Emperor William to select a monarch for the Norwegians from the ranks of German princes is not likely to be seriously considered, for Norway could do nothing more suicidal than to put herself in Germany's power by such an alliance.—*The World To-day, Sept.*, 1905.

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THE SEMI-CENTENNIAL OF THE "SOO"

An occasion of noteworthy historic interest was the celebration on August 2 and 3 of the fiftieth anniversary of the opening of the St. Mary's ship canal at Sault Ste. Marie, Michigan. Many state officials, congressmen and federal officials of the United States and Canadian governments were present for this celebration. Vice-President Fairbanks in his address called attention to the fact that the enormous shipping which passes through the Soo Canal each year is almost wholly American. He contrasted this situation with that which exists on the Atlantic Ocean, where American ships are so rare as to excite attention. The commerce of the Sault Ste. Marie Canal has grown rapidly since the development of the iron and copper mines of the Lake Superior region and the perfection of ore-carrying boats and ore-handling machinery. When the canal was constructed fifty years ago the most optimistic observers could hardly have foreseen the astonishing development of lake commerce which has taken place during the last twenty-five years.—*The World To-Day, Sept.,* 1905.

THE YELLOW FEVER IN NEW ORLEANS

The yellow fever epidemic at New Orleans has assumed alarming aspects, owing to the rapid spread of the disease in new localities. Each day cases are reported from districts hitherto exempt and new centers of infection are thus created. The total number of cases to date is over six hundred and the deaths about one-fifth of the cases reported. Most prominent among these victims is Archbishop Chapelle, who had returned to New Orleans to assist in fighting the fever. The city and state authorities having requested the assistance of the federal government, the situation is now in charge of the surgeon-general. Strict quarantine measures have been adopted to prevent the spread of the disease to adjoining states. It is notewothy that, although the mosquito theory of the origin of yellow fever has been very generally rejected in New Orleans up to the present time, the present fight against the epidemic is based wholly on that theory. If the multiplication of the mosquito can be arrested by oiling the cisterns and other reservoirs, and if the insect can be kept from contact with yellow-fever patients, according to this hypothesis, no new cases can arise.—*The World To-Day, Sept.,* 1905.

THE CAPITAL OF ALASKA

The capital of Alaska has recently been changed from the historic town of Sitka to the thriving mining city Juneau.

NOTES

CHANGE IN WHOLESALE PRICE OF TOPOGRAPHIC MAPS.—On and after July 1, 1905, the *wholesale rate* on all topographic maps *will be advanced one-half;* that is, the price of the standard or small size sheet will be increased from $2.00 to $3.00 per hundred, and the price of the large maps will be increased proportionately. The discount will be 40 per cent. of the retail price when 100 or more standard topographic atlas sheets, or their equivalent in other maps, are ordered. In no case can orders be filled at the wholesale rate unless the sum remitted solely for topographic maps amounts to at least $3.00. No change will be made in the retail rate.

No order received after June 30, 1905, will be filled at the old rate, no matter when dated or when mailed.

A wholesale rate immediately effective has been established for topographic and geologic folios, whenever the sum transmitted solely for folios at the wholesale price amounts to *at least* $5.10; that is, a discount of 40 per cent. will be given whenever 34 or more folios that sell singly for 25 cents, or their equivalent in higher priced folios, are ordered at one time.

Attention is called to the fact that folios and topographic maps *can not be combined* in a single order at *wholesale rates unless the sum remitted for each is at least the minimum* stated above.

Prepayment is required, and may be made by money order payable to the order of the Director of the United States Geological Survey, or in cash—the exact amount. Checks and postage stamps can not be accepted.

All correspondence should be addressed to

THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

ERRATA.—In the article "Practical Exercises to explain the Topographic Map" in the May-June issue of this magazine, the following typographical errors should be corrected:

1. In the text:

Page 223, last	line,	read: Pl. I, I*b*, I*c*,	for: Pl. I, I*B*, I*C*.
224, first	"	read: Pl. I, I*a*; Pl. III*C*,	for: Pl. I, I*A*; Pl. III, II.
224, fourth	"	read: *outlines*,	for: *lines*.
224, 32d	"	read: I*a*, *b*, *c*,	for: I*A*, *B*, *C*.
224, 33d	"	read: II*a*, *b*, *c*,	for: II*A*, *B*, *C*.
225, 5th	"	read: *III*,	for: *d*.
225, 12th	"	read: *III*,	for: *BI*.
225, 14th	"	read: *II*,	for: *BII*.

2. On the plates:

The numbering of the illustrations was to have been as follows:

Plate I. A. Topographic map. *(Not: IA.)*
B. 100 Ft. Contours, colored. *(Not: IB.)*
C. 100 Ft. Contours, uncolored. *(Not: IC.)*
D. Sections:
Ia. Longitudinal section:
Horizontal scale, 1 inch=1 mile.
Vertical scale, 10 inches=1 mile, (1 inch=25 contours).
Ib. Cross section, same scales.
Ic. Second cross section, same scales.

Plate II.
IIa. Part of section Ia, in natural proportions.
Horizontal and vertical scales, 10 inches=1 mile.
IIb. Part of transverse section Ib, in natural proportions, same scales.
IIc. Part of transverse section Ic, in natural proportions, same scales.
III. Profile Ia, in natural proportions. *(Not: IId.)*
Horizontal and vertical scales, 5 inches=1 mile.
E. Cardboard contour model. (Contour relief map.) *(Not: IIe.)*

Plate III.
A. Topographic map. *(Not: IIIA.)*
B. Contour line relief. *(Not: IIIB.)*
C. Sections:
Ia. Longitudinal section, horizontal: vertical scale=1:10.
Ib. Cross sections, same scales (looking south).
II. Part of section Ia, natural proportions.
Both scales, 5 inches=1 mile.
III. Same. Horizontal scale=1:10, vertical scale=1:5.
IV. Same, in contour line relief.

Plate IV.
A. Topographic map. *(Not: IVA.)*
B. Sections:
I. Horizontal, 1 inch=1 mile; vertical, 10 inches=1 mile.
II. Horizontal, 1 inch=1 mile; vertical, 5 inches=1 mile. *(Not:IVB.)*
III. Part of same, from x to z, natural proportions.
Horizontal and vertical, 5 inches=1 mile. *(Not: IVB.)*
C. Contour line relief. *(Not: IVC.)*
D. Sectional view of contour line relief. *(Not: IVCIV.)*

THE NEW PROVINCES OF CANADA:—The four territorial districts of Alberta, Athabaska, Saskatchewan and Assiniboia have recently given way to new provinces, Alberta and Saskatchewan. The eastern boundary of Saskatchewan is the western boundary of Manitoba extending northward. The western boundary is the 110th meridian. The region lying between this meridian and the western boundary of British Columbia is the province of Alberta. The northern boundary of the provinces is the 60th parallel.

THE MOON AND THE WEATHER.—The moon was for a long time widely held, and deep in popular belief, as the great weather breeder and prognosticator. But in recent years the lunar idea of weather control has been largely discarded. This belief could hardly be considered more than a mere superstition, as it is impossible to see from an astronomical analysis how the varying positions of the lunar cusps could in any way be connected with the character of weather.

The moon's appearance to us depends on the relative position of the moon and sun in regard to the observer's horizon. From new to full, the moon gradually increases from a crescent to a full circle, and back again from full to new. The positions of the crescent vary, as the moon (shining by the light of the sun which she reflects to us) is sometimes north of the sun's path and sometimes south of it. The variation is probably noticed most in the new moon which is seen when the sun is just below the horizon. A line joining the horns of a new moon is sometimes nearly vertical, and oftentimes nearly horizontal. These were supposed to foretell the weather, the first being called "wet moon" and the second "dry moon."

Even if the several lunar phases did influence our atmosphere, the same phase should produce the same effect all around the world (as the earth revolves on its axis in twenty-four hours) for any given latitude circle. It is true that the ocean tides are for a large part the result of the moon's attraction, but this force when applied to the earth's atmosphere, is wholly insufficient to produce any appreciable disturbance in the atmosphere. It is most probable that the moon belief grew up out of the naturally frequent coincidence between certain weather changes (and certain brands of weather) and selected moon phases. The moon enters a new phase, or quarter, every seventh day, and the weather (at least in the middle latitudes) changes on the average of one to two times in seven days; hence there must be a great many accidental coincidences. And if one counts the agreements and overlooks the disagreements, quite a theory could be announced. The lunar phase theory was not found to bear the test of accurate comparison of weather observations with the lunar phases, except in this very slight and imperfect manner, which is entirely insufficient to have any value in weather prediction. Nevertheless, the moon and her changing phases have been the basis of nearly all the weather forecasts found in the almanacs. And the almanac has probably received more wide distribution, and has been more greatly cherished by the people of all countries, than any other publication, next to the Bible.

Nearly all countries have had their almanacs, but they were particularly popular in Germany and England. In America, probably, the al-

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manac which has been more widely read and its weather forecasts more generally credited than any other, is the Hagerstown Almanac, which has been published regularly every year since 1794. Yet the weather predictions appearing in it were based entirely upon the time of day the moon entered into any one of her four quarters. For instance, if this happened between midnight and 2 A. M. it indicated fair weather in summer, and fair with hard frost in winter, unless the wind be south or southwest. While, on the other hand, if this change occurred between noon and 2 P. M., it indicated very rainy weather in summer, and rain or snow in winter. And so a table claimed to be constructed on a due consideration of the attraction of the sun and moon in their several positions respecting the earth, was prepared for all the hours, and thus was weather forecasting simplified and made easy.

The full moon has usually been associated with clear, cold weather. This is probably because we notice the full moon so much more when the weather is clear, and also clear nights are cooler on account of the more rapid radiation of the earth's heat than when blanketed with clouds. Also since the moon's path on the heavens is so near the ecliptic, and full moons are always 180 degrees from the sun, they are far north in winter, and thus longer above the horizon in the northern hemisphere than they are in summer, and thus we associate full moons with our long, cold, winter nights.

So much for the moon as a weather forecaster.—From *Fake Weather Forecasts, Popular Science Monthly, October,* 1905.

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